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THE
AGRICULTURAL LEDGER.

1898—No. 16.

FLEMINGIA CONGESTA.

(THE WARAS DYE.)

DICTIONARY OF ECONOMIC PRODUCTS, Vol. III., F. 633-42.)

THE ARABIAN DRUG WARAS OR WARS.

*A Description of its History, Uses and Composition, with Remarks on its
Occurrence in India. By THE OFFICIATING EDITOR.*

Other DICTIONARY articles that may be consulted :

Mallotus philippinensis, Vol. V., M. 71-86.



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(Vegetable Product Series, No. 44.)

(Dye and Sons.)

THE
AGRICULTURAL LEDGER.

1898—No. 10.

FLEMINGIA CONGESTA.

(THE WARAS DYE.)

[*Dictionary of Economic Products*, Vol. III, P. 633-42.]

THE ARABIAN DRUG WARAS or WARS.

A Description of its History, Uses and Composition, with Remarks on its Occurrence in India. By THE OFFICIATING EDITOR.

This number of *The Agricultural Ledger* deals with the history and properties of the Arabian drug *Waras*, and the discovery of a similar substance on species of *Flemingia* growing in India. The report by Mr. A. G. Perkin, of the Research Laboratory of the Dyeing Department, Yorkshire College, Leeds, shows that the indigenous product is superior to *Kamela* (*Mallotus philippinensis*) in imparting an orange colour to silk fabrics. All the available information on *Waras* is reproduced, for the sake of convenience, in the form of a revision of the article in the *Dictionary of Economic Products*.

Flemingia congesta, Roxb. *Fl. Br. Ind.*, II., 228; *Wight J.*, I. 390; LEGUMINOSÆ.

Vern.—*Bom-salpan*, *bhalia*, *supta cusunt*, HIND; *Bara-salpan*, *bhalia*, BENG.; *Burm ekasira nari*, *bir but*, SANTAL; *Batwasi*, NEPAL; *Mipit muk*, LEPCHA; *Dangshukop*, MICH; *Dowdowid*, BOMB. and MAR.; *Tha kya nar*, BURM.

INTRODUC-
TION.

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**FLEMINGIA
congesta.****The Arabian Drug Wars or War.**

References.—Roxb., *Fl. Ind.*, Ed. C.B.C., 572; Gamble, *List of Trees, Shrubs, etc., of Darjeeling*, 28; Dals. & Gibs., *Bomb. Fl.*, 75; *Science Papers*, 73; Rev. A. Campbell, *Report on Econ. Prod., Chulia Nagpur*, No. 8465; Atkinson, *Econ. Prod. N.W.P.*, Pt. V., 94; *Kew Report*, 1881, 50; *Kew, Og. Guide to Mys.*, 45; *Report Bot. Gard. Nilgiris*, 1884-85; *Pharmacog.*, 573; *Mat. Med., W. Ind.*, 708; *Pharmacog. Ind.*, 1, 400; *Pharm. Journ.*, XII. (1853), 389 (Hambury); [2] IX. (1852), 279, (Flückiger); [3] XIV. (1884), 897 (Kirby); [3] XVI. (1884), 917 and 969 (Thimilton Dyer); [3] XVII. (1887), 1024 and XVIII. 110 (Flückiger); [3] XVIII. (1887), 213 (Hesper). *Journ. Chem. Soc.*, Aug. 1898, 660 (Perkin).

HISTORY.

History.—Dr. Roxburgh about a century ago called attention to the fact that certain plants belonging to the genus *Flemingia* possessed on the surface of their pods a number of red-coloured glands. In his "*Flora Indica*" he remarks, that *F. procumbens*, a native of the mountains north of Oudh and Rohilkhand, had its legumes and calyx besprinkled with garnet-coloured grains, and that *F. nana* found in the vicinity of the Ganges towards Hurdwar had its legumes densely enveloped with clammy reddish powder.

Plants
yielding
glands.

In Burma the pods of *F. prostrata* of Roxburgh have been found to be densely covered with purplish black resinous dots, and Kurz in "*Forest Flora of British Burma*," alludes to the presence of black resinous dots when describing the legumes of *F. sericans* (*F. Wallichii*, *W. and A.*), *F. lineata*, *Roxb.*, and *F. ferruginea*, *Grah.*

In the "*Flora of British India*" Mr. J. G. Baker has reduced all the above-named plants with the exception of *F. Wallichii* and *F. lineata* to one species, *vis.*, *F. congesta*; and *F. Grahamiana*, *W. and A.*, a Nilgiri and Burmese plant, also affording red viscous glands, is not far removed from it specifically.

Kamela.

The only other glandular product that bears any resemblance to that found on the pods of these leguminous shrubs is the red-coloured powder known as *Kamela* which is obtained from the capsules of a Euphorbiaceous tree, *Mallotus philippinensis*.

Kamela is a well-established dye in India and its botanical origin has been long known, but it is only within the last few years that Waras, an equally ancient drug, has been referred to a species of

The Arabian Drug Wars or Wara. (D. Hooper.)

FLEMINGIA
congesta.

Flemingia growing in the East. The history of this discovery is of great interest in showing the difficulties experienced in tracing the source of products which lie outside the beaten tracts of European commerce.

Arabian physicians as early as the tenth century mention this drug under the name of *Kinbil* or *Wara*. Ibn Khurdadbeh, an Arab traveller living A.D. 849-885, states that "from Yemen came striped silks, ambergris, wars and gunt." Kaswini in the thirteenth century was also acquainted with wars which he says was a plant sown in Yemen and resembling sesamum. Constantinus Africanus likewise spoke of *Amars*. It should be remembered that Wars, Wors, Wurrus or Warra in Arabic are, properly speaking, terms signifying saffron, the origin, among a few other plants, of the auspicious yellow dyes of Eastern countries.

These earlier Arabian writers appear to have confounded the drug *Amala* or *kinbil* (the Sanskrit name converted into an Arabic form) with the wars produced in Arabia and Ethiopia. The red kinbil or wars mentioned by them was probably all imported from India as we have no evidence that *Mallotus philippinensis* grows in Arabia and North-East Africa.

In later writings these two drugs are more particularly distinguished, and an Abyssinian variety is described as being black and an Indian which is red. The author of the "Kamus" who wrote about A.H. 768, notices both kinbil and wars, and treats them as two distinct substances. He says of kinbil that it is red and astringent and that it kills and expels intestinal worms and cures scabby affections of the skin. Of wars he says the plant is like sesame and only found in Arabia; externally applied, it removes freckles; taken internally it cures leprous eruptions, but not a word is mentioned about anthelmintic properties. The author of "Makhzan" speaking of wars says there is a black kind, which comes from Ethiopia and it is called *Ashki*, and a dull red kind, which is called Indian and is the worst as a dye; he concludes by remarking that the seeds of the wars are like *Mash* (*Phaseolus Mungo*, var. *radiatus*). It is described as aphrodisiac, lithontriptic and a remedy for ringworm, pyriasis and freckles.

The two drugs began to attract attention in England in 1853, when Dr. James Vaughan, Fort Surgeon at Aden, published

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History.

Arabian
accounts.

Later
authorities
quoted.

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The Arabian Drug Warras or Warr.

HISTORY.

Dr.
Vaughan's
Notes.

his notes upon the drugs observed at Aden and other places in Arabia.

The following extract refers to the products under discussion :—

"*Wurrus* or *Warras*, a red powder used chiefly as a dye, is the produce of a plant resembling sesame. I am informed that the plant rises to about five feet in height, bearing several separate bunches or clusters of small round seeds, which are covered with a description of pollen or flower; this removed from the seed-clusters by gentle rubbing or shaking, constitutes the dye; the seeds are afterwards thrown away. Two kinds of *Wurrus* are brought into the market. The best comes from the interior, principally from the towns of O Badan and Gebia and the districts of Yaffae and Sijbul Rudfan. A second kind brought by the Somalis of the opposite coast, comes from the neighbourhood of Hurre, this is not so much valued and does not realize the price of the other sort. A considerable quantity of the dye I find is exported to Bombay; it is used principally by the people of Surat for the purpose of imparting a light brown yellow colour to their silks, which are much prized and worn by the Native ladies. I believe that *Wurrus* is used for silks only and not for cotton or woollen stuffs. Besides being employed by the Arabs of this part as a dye, the colour produced being highly esteemed, they use it likewise as an internal medicine in cases of leprosy, and externally in solution as a lotion to remove freckles and pustules. Much of this dye finds its way to the Persian Gulf, where it is known under the name of *Asberg*. *Wurrus* sells in Aden for about twenty-four rupees the maund, but the African or inferior description realizes only from seventeen to eighteen rupees the maund."

Mr. D. Hanbury remarks that the *Wurrus* of which two samples had been received from Mr. Vaughan consisted of a dull red granular, sand-like powder, mixed with small fragments of stalk and leaves, and presumed that it was the *warras* of Niebuhr, which he speaks of as "herbe qui teint en jaune et dont on transporte quantité de Mocha dans l'Oman" (see "Description d'Arabie," Amsterdam et Utrecht, 1774, p. 133).

Identifica-
tion of
Wurrus.

Mr. Hanbury carefully examined this powder and assigned to it its proper position in the vegetable kingdom in a paper subsequently read that year on "*Wurrus*, a dye produced by *Rottlera tinctoria*." The latter name of the plant given by Roxburgh is now changed by botanists to that of *Mallotus philippinensis* of *Muller Argoviensis*. The glandular powder called kamala was made official in the British Pharmacopoeia of 1867, but its use as a medicine has

The Arabian Drug Waras or Wars. (D. Hooper.) **FLEMINGIA congesta.**

gradually declined, and it has been omitted from the recently published Pharmacopœia of 1898.

Many conjectures were made as to the source of the second kind of kamala or waras and Dr. Sprengel suggested that it was obtained from *Memecylon tinctorium*, (*M. edule*, *Roxb.*) the leaves of which are used in India for dyeing silk. No glands, however, have been found upon any part of this shrub. The Asberg alluded to in Mr. Vaughan's note as being sold in the Persian Gulf ports is now considered to be the drug known under the various synonyms *Asperag*, *Trayemán*, and *Zalil*. This consists of the dried herb *Delphinium Zalil* of Atchison and Hemaley, growing in the moister localities of the Badghis and Khorasan, and exported from Persia as a yellow dye.

In 1867 an authentic supply of waras was imported from Aden by Messrs. Allen and Hanbury, London. It arrived neatly packed in oblong, white calico bags of three sizes each inscribed with Arabic characters, indicating the name of the vendor or collector, a native of Hurrur, a town in Eastern Africa which is a great trading station between the Galla countries and Barbera; the net weight was either 100, 50 or 25 Turkish ounces. No more than two supplies, in all 136 lb., could be obtained.

The drug was submitted to a microscopical examination by Professor F. A. Fluckiger, of Strasburg, who noticed that it was in coarser particles than kamela, it had a deep purple colour and a distinctly peculiar odour. It had evidently been carefully collected and was free from earthy admixture, yet it left upon incineration 12 per cent. of ash. It blackened at a temperature of 100° C., losing 5.2 per cent. of water; kamela under such circumstances undergoes no change of colour.

Under the microscope waras presented still greater differences, the grains being cylindrical or sub-conical, 170 to 200 μ m. long by 70 to 100 μ m. broad, and therefore much larger than kamela glands. The grains are furnished with oblong resin cells arranged perpendicularly in three or four storeys or stages, containing about twenty cells in each stage, very dissimilar to the radiate arrangement seen in ordinary kamela. The grains were mixed with a few long colourless, transparent, simple hairs, not stellate or tufted as in the allied drug.

HISTORY.

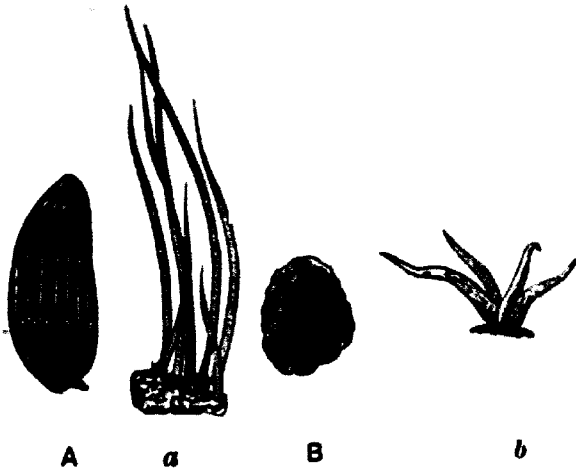
Confused with other dyes.

Imported from Aden.

Professor Fluckiger's examination.

FLEMINGIA
congesta.

The Arabian Drug Wars or Wars.

HISTORY.A.—Gland of *Flemingia* pods.

a.—Simple hairs of ditto.

B.—Gland of *Mallotus philippinensis*.

b.—Tufted hairs of ditto.

Description
of wars.

The above illustrations are reproduced from those given by Professor Fluokiger in his paper written in 1867, on "A New Kind of Kamala." It is at once seen that, apart from the dissimilar structure as observed under the microscope, it differs from the *Mallotus* glands in the larger size and deeper colour of the grains.

A Swiss firm in Aden sent to Professor Schaer, in 1878, a powder under the name of *Wars* which was identified with the above. It was said to be used chiefly in the coast districts of Muscat (Oman) and Hadramaut, in skin diseases and as a dye.

Efforts were made in different quarters to ascertain the botanical source of the purplish-red powder. At the suggestion of Professor Fluokiger, Major Hunter, the Assistant Resident at Aden, kindly interested himself in the matter and succeeded in obtaining specimens of the plant said to yield the Arabian wars. A dried plant was also sent to Kew with a note stating that it was gathered at an elevation of 6,000 feet on Jebel Dhubarah, 60 miles due north of Aden. The plant was immediately identified with the leguminous

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FLEMINGIA congesta.

shrub *Flemingia congesta*, Roxb., and the fact was announced in the "Kew Report" for 1880.

HISTORY.

The following interesting Notes on the collection of the dye at Harrar were contributed by Major Hunter, and published by Mr. W. T. Thiselton Dyer, C.M.G., C.I.E., F.R.S., Director of the Royal Gardens, Kew:—

Major Hunter's Notes.

"In the neighbourhood of the city 'wars' is not now raised from seed sown artificially, and it is left to nature to propagate the shrub in the surrounding terraced gardens. The plant springs up, among *jowari* (*Andropogon Sorghum*), coffee, etc., in bushes scattered about at intervals of several yards more or less. When sown, as among the Gallas, it is planted before the rains in March. If the soil be fairly good a bush bears in about a year. After the berries (pods) have been plucked the shrub is cut down to within six inches of the ground. It springs up again after rain and bears a second time in about six months, and this process is repeated every second year until the tree dies. Rain destroys the berry (pod) for commercial purposes; it is, therefore, only gathered in the dry season ending about the middle of March. The bush grows to a maximum height of six feet, and it branches close to the ground. The growth is open and the foliage sparse. Each owner has a few acres of land.

"In the middle of February, 1884, the following processes were observed:—

"The leaves [? fruiting shoots] of some plants were plucked and allowed to dry in the sun for three or four days. (The picking is not done carefully and a considerable quantity of the surrounding twigs, etc., is mixed with the berries [pods]). The collected mass was placed on a skin heaped up to about six or eight inches high and was tapped gently with a short stick about half an inch thick. After some time the pods were denuded of their outer covering of red powder which fell through the mass on to the skin. The upper portion of the heap was then cleared away and the residual reddish-green powder was placed in a flat woven grass dish with a sloping rim of about 1½ inch high. This receptacle was agitated gently and occasionally tapped with the fingers, the result being the subsidence of the red powder and the rising to the surface of the chaffy refuse which latter was carefully worked aside to the edge of the dish and

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**FLEMINGIA
congesta.****The Arabian Drug Waras or Wars.****HISTORY.**

then removed by hand. This winnowing was continued until little remained but red powder. (No great pains are even taken to eliminate all foreign matter.) A roll was sold in 1884 for about 13 piastres = 1 rupee 10 annas nearly.

Uses.

"'Wars' is sent to Arabia, chiefly to Yemen and Hadhramaut, where it is used as a dye, a cosmetic and a specific against cold. In order to use it, a small portion of the powder is placed in one palm and moistened with water, the hands are then rubbed smartly together, producing a lather of a bright gamboge colour, which is applied as required."

**Botanical
sources.**

Subsequent consignments of the waras plant from Aden, through the assistance of Major Hunter, were forwarded to Kew and they were found to bear a close resemblance to *F. rhodocarpa*, Baker, a plant discovered previously at Mozambique and characterised by having its pods covered with a bright-red, resinous pubescence. A sample of Somali waras received in 1883 was mixed with seeds of a dull brown colour mottled with black; this description applies to the seeds of *F. rhodocarpa*, and a further scrutiny led to the conclusion that this or an allied species was the origin of waras. Professor Oliver subsequently discovered that *F. Grahamiana*, apparently confined to South India was not specifically distinguishable from the African plant *F. rhodocarpa*, as the pods were clothed with the same peculiar epidermal glands.

**Discovery
on the
Nilgiris.**

Mr. M. A. Lawson, about this time (1883), was appointed Government Botanist of Madras and Director of the Cinchona Plantations Nilgiris, and he was invited by Mr. Thibetson Dyer, to examine the *Flemingias* in the neighbourhood with the object of more particularly investigating the epidermal glands said to be attached to the pods. Mr. Lawson succeeded in collecting several ounces of the powder which was the produce of *F. Grahamiana* and *F. congesta*. "With respect to the distinctive characters of these two species," he wrote in the annual report, "I pointed out that after studying the plants in their living condition, I did not think them sufficiently constant to allow of the two species being kept separate, and in this opinion both Mr. Thibetson Dyer and Professor Oliver now concur. *F. congesta* is the hill form growing on more or less exposed places, while *F. Grahamiana* grows at lower elevations and in woods."

F. Grahamiana*.**F. congesta*.**

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FLEMINGIA congesta.

Through the kind offices of Dr. D. Prain, I have been permitted to examine all the Indian *Flemingias* preserved in the Herbarium of the Royal Botanic Garden, Sibpur. The pods of a goodly number of the forms were observed to yield more or less the glandular powder, but it was particularly evident on *F. Grahamiana*, *Wight.*, *F. congesta* var. *Wightiana* (*F. Wightiana*, *Bruth.*) and *F. Wallichii*, *W. & A.* Dr. Prain considers the *Grahamianian* species to be quite distinct from *F. congesta*. All the mounted plants of this genus whether they afforded the glands or not were capable of staining the paper on which they were fixed an orange-yellow colour, owing to the employment of alcoholic solution of corrosive sublimate in poisoning them.

On the Nilgiris the fruits ripen in the cold weather during December and January when they are covered with the peculiar red glands. The drug is collected by cutting off the clusters of pods from the ends of the branches and placing them in the sun to dry for one or two days. They should be placed on boards or paper, as during the process of drying much of the powder falls, and would be lost unless such a precaution were taken. The pods are then pressed or rubbed together by hand over sieves. The powder will be found to be mixed with hairs, stones and pieces of stalk; from these impurities it is readily removed by finally passing it through a fine muslin or lawn sieve.

Although the plants occur pretty frequently in India very little seems to be known by the natives of their colouring or medicinal properties, and from enquiries made of local traders, no information could be gleaned of the powder being a marketable article. At an exhibition of the Agri-Horticultural Society of Madras held a few years ago, some of the powder was said to be shown by a native dyer, but this has not been observed since, and kamela is the usual vegetable dye used for colouring silk in Madras.

Rev. A. Campbell, in a report on the economic products of Chota Nagpur, writes of *F. congesta*:—"The pods are said to yield a dye." It would thus appear that the Santals are to some extent familiar with the nature of the shrub.

The plants are not sought after by the natives as they appear to have very little virtue either in medicine or food. Atkinson reports that the pods are occasionally eaten in the North-West Provinces,

HISTORY.

Collection.

Wares not a trade article.

Known by Santals.

Further uses of the plant.

**FLEMINGIA
coagesta.****The Arabian Drug Waras or Wara.****HISTORY.**

and Rev. Mr. Campbell informs us that the roots are employed by the Santals as an external application to ulcers and swellings, mainly of the neck.

F. tuberosa.

Flemingia tuberosa, *Dals.*, a native of the Konkan, affords tuberos roots which are eaten either raw or roasted, and are considered medicinal. **F. vestita**, *Brush.*, of Assam, yields a tuber known as *Soplang*, which is grown as a crop similar to the potato. It is interesting to notice that the leaves of these two plants are studded with minute golden glands which consist of a pigmental resin.

**CHEMICAL
COMPOSITION.**

Chemical Composition.—The resinous colouring matter which constitutes the chief part of waras has a brittle consistence; it is of a deep garnet-red colour in bulk and orange-red when observed in thin strata. It is soluble in ether, alcohol, chloroform, acetic acid, and in solutions of potash, soda and ammonia and the alkaline carbonates. Sulphuric acid dissolves it in the cold. Heated with nitric acid it rapidly oxidises, yielding yellow-coloured products and a resin soluble in alcohol. Heated with potash or soda an odour of citron is evolved. An ethereal solution of the resin allowed to evaporate spontaneously deposits a mass of crystals. The crystals are lighter in colour than the surrounding red resin, and examined microscopically, they appeared as crops of acicular prisms radiating from a common centre. The name "flemingin" was suggested for these crystals when the writer analysed the drug in 1887.

Besides the resinous and crystalline principles of waras, there are albuminous and saccharine matters soluble in water, an amount of ash varying between 5 and 12 per cent., and a trace of volatile oil. The following results of an approximate analysis of waras made by the writer are reproduced, together with an analysis of kamela made by Dr. Thomas Anderson, of Glasgow, in 1855 :—

**Proximate
analysis.**

	Waras.	Kamela.
Resinous colouring matters	72.83	78.19
Albuminous matter, etc.	8.20	7.34
Cellulose	9.50	7.14
Water	3.44	3.49
Ash (principally sand)	6.03	3.84
Volatile oil	trace	trace
	<hr/> 100.00	<hr/> 100.00

**Mr. Perkin's
analysis.**

A chemical examination of waras has very recently been made by Mr. Arthur George Perkin, F.R.S.E., whose invaluable researches in the natural colouring matters of India are well known. The

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FLEMINGIA congesta.

CHEMICAL
COMPO-
SITION.

results of the investigation were communicated to the Chemical Society of London in a paper entitled "Constituents of the Indian Dye-stuff Waras, *Flemingia congesta*" (*Journ. Chem. Soc., Aug. 1898*). At the instance of the authorities at the Imperial Institute the sample consisting of a few ounces of the powder had been collected at Naduvattam, on the Nilgiri Hills, and was forwarded to London through the Reporter on Economic Products to the Government of India.

The analysis resulted in the isolation of the following constituents:—

Flemingia $C_{12}H_{12}O_4$ is a dull orange-red crystalline powder, consisting of small prismatic needles melting at $171-173^{\circ}$. In appearance and numerous properties it resembles the rottlerin of *Kamala*, but is distinguished from this by its solubility in alcohol and acetic acid, and by the browner tint of its alkaline solutions. In an alkaline bath, it dyes silk a golden yellow and is a stronger dye-stuff than rottlerin. On fusion with alkali it gave acetic acid, salicylic acid and an acid of higher melting point which was not identified.

Flemingia.

Homoflemingia ($C=69.97$; $H=5.75$), a yellow colouring matter, present only in minute quantity, forms glistening yellow needles, melts at $164-166^{\circ}$, and possesses properties resembling those of flemingin.

Homoflemingia.

Resin of high melting point, $C_{12}H_{12}O_2$, forms a brick-red powder soluble in alkali with a deep brown tint and yields acetic and salicylic acid on fusion with alkali. It dyes silk in shades which are redder than those produced by flemingin.

Resins.

Resin of low melting point $C_{12}H_{14}O_2$ is a deep orange-brown transparent mass which melts below 100° , is soluble in alkali with an orange brown colour and closely resembles the resin of low melting point of *kamala*. On fusion with alkali, acetic and salicylic acids are obtained, and on boiling with nitric acid (sp. gr. 1.5) oxalic acid is formed.

Mr. Parkin summarises the results of the examination in the following terms:—"This investigation indicates that waras contains five distinct substances, namely, flemingin, homoflemingin, resins of high and low melting points, and a wax. Although these are not identical with any constituent of *kamala*, the analogy between these

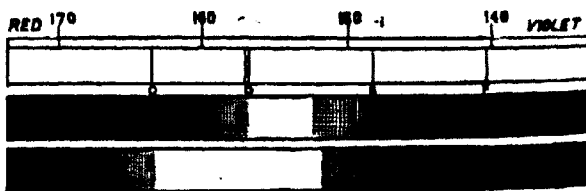
Summary.

**FLEMINGIA
congesta.****The Arabian Drug Waras or Wars.****CHEMICAL
COMPOSITION.**

drugs is remarkable, for from the latter rotlerin, homorotlerin, a high and low melting resin and a wax can be isolated. The products from both sources, moreover, have many special characteristics in common, and there can be but little doubt that a close chemical relationship exists between them. The kamala substances contain, as I have previously pointed out, a cinnamyl nucleus, and thus, by decomposition with alkali, give benzoic and acetic acids; those from waras, on the other hand, yield in the same way salicylic and acetic acids, which suggests they may contain a hydroxycinnamyl group."

**PHYSICAL
PROPERTIES.****Spectrum.**

Spectrum of Waras.—The physical properties of the colouring substances were examined by preparing separate tinctures of waras and kamela, and observing each by means of a spectroscope. The tincture of waras had a deeper red colour than that of kamela and was mixed with more spirit to make the two tinctures resemble each other in tint. Notwithstanding the dilution, the spectrum of waras showed more absorption than the kamela. There was complete absorption at both ends of the spectrum, and no darkness in either case at the Fraunhofer line D. The only difference of note was that the soluble constituents of kamela were transparent to a light of somewhat greater wave length than waras. No absorption bands were visible in either spectrum. The accompanying illustration shows the peculiarities of the spectra of the two pigments. It is reproduced from an article printed in the *Proceedings of the Royal Society of Edinburgh* for 1890 on "The absorption spectra of certain vegetable colouring matters," contributed by Prof. C. Michie Smith, of Madras.

Waras.**Kamela.****DYEING
PROPERTIES.**

Dyeing Properties.—Waras like kamela is an excellent dye for silk, but is not suitable for linen or cotton. Mr. (now Sir Thomas) Wardle, of Leek, undertook in 1884 to examine the dyeing properties of waras, a sample of which had been collected by Mr. Lawson on the Nilgiris. Mr. Wardle reported that the substance

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contained a small amount of colouring matter compared with the vegetable yellow dyes of commerce and no colour could be obtained from it which would compare in depth and richness with those produced by kamela. Waras also appeared to be inferior to kamela in permanence as regards the action of light. The colour of waras was noticed to easily turn brown by alkaline solutions, whilst kamela is only slightly reddened. Both dyes, however, resist the action of acids very well. Waras was tried on cotton with and without mordants, and the result was a pale shade of yellow.

DYEING PROPERTIES.

Mr. Perkin offers the following remarks as the result of his experiments with this pigment:—"Suspended in a boiling solution of its own weight of sodium carbonate, waras readily dyes silk golden yellow shades, very similar to those produced by kamela, but slightly duller and more orange. Material was not available for extended study of its tinctorial properties, but it was at once evident that, in strength, waras is a decidedly superior dye-stuff to kamela. Whether it is capable of competition with the yellow dye-stuffs of commerce cannot be determined until larger quantities can be procured for more extended work in this direction. In the meantime, I shall be grateful for information which will enable me to obtain a supply of this material."

Superior to Kamela.

The opinions of the two experts are somewhat divergent considering the fact that the samples had been gathered from similar plants growing in the same district of South India. The powder used by Mr. Wardle was slightly mouldy and had been damaged owing to the excessive wetness of the season; on the other hand, the specimen sent to Mr. Perkin had been procured in the dry weather and was despatched without delay in a stoppered bottle.

Divergent opinions.

The larger proportion of resinous colouring matter in the waras, the richness of its solutions, and the absorptive power observed in a spectrum, indicate its superiority over kamela, and confirm Mr. Perkin's conclusions.

Notwithstanding the wide distribution of *Flemingia* plants in India the glandular hairs peculiar to some species are at present not much more than a botanical curiosity. Now that attention has been drawn to the Arabian trade in an identical substance and to the delicacy of the dye from an indigenous source, it is hoped that those in a position to do so may be induced to search for the powder and endeavour to make it a commercial article.

Further information required.

F. 633-42.

All communications regarding **THE AGRICULTURAL LEDGER** should be addressed to the Editor, Dr. George Watt, Reporter on Economic Products to the Government of India, Calcutta.

The objects of this publication (as already stated) are to gradually develop and perfect our knowledge of Indian Agricultural and Economic questions. Contributions or corrections and additions will therefore be most welcome.

In order to preserve a necessary relation to the various Departments of Government, contributions will be classified and numbered under certain series. Thus, for example, papers on Veterinary subjects will be registered under the Veterinary Series; those on Forestry in the Forest Series. Papers of more direct Agricultural or Industrial interest will be grouped according as the products dealt with belong to the Vegetable or Animal Kingdom. In a like manner, contributions on Mineral and Metallic subjects will be registered under the Mineral Series.

This sheet and the title-page may be removed when the subject-matter is filed in its proper place, according to the letter and number shown at the bottom of each page.

NOTICE.

Future issues of this publication placed under either the "Special Veterinary" or "Special Forest Series" will not be included in the annual enumeration. As papers are printed for Departmental purposes. Their unfortunate inclusion in the system of annual numbering has led recipients of the ordinary issues to find their sets incomplete.

The following pamphlets have already appeared as Special issues, and have not accordingly been furnished to the public.

1894	.	.	.	Nos. 8, 9, 10, 11, 13 and 15.
1896	.	.	.	No. 8.

